

First record of *Cirrimaxilla formosa* (Muraenidae) from New Caledonia, found in sea snake stomach contents

by

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RÉSUMÉ. - Premier signalement de *Cirrimaxilla formosa* (Muraenidae) de Nouvelle-Calédonie, trouvé dans des estomacs de serpents marins.

Plusieurs spécimens de *Cirrimaxilla formosa* (Muraenidae) ont été trouvés dans les estomacs de serpents de mer, *Laticauda laticaudata* et *L. saintgironsi*, capturés en Nouvelle-Calédonie dans le cadre d'une étude écologique sur ces serpents. Ces spécimens représentent le premier signalement de *C. formosa* en Nouvelle-Calédonie. Cette murène n'était jusqu'à présent connue que par son holotype récolté dans le sud de Taiwan.

Key words. - Muraenidae - *Cirrimaxilla formosa* - ISEW - New Caledonia - First record.

Sea kraits (Elapidae, Hydrophiinae) are large (up to 1.5 TL) venomous sea snakes that forage in the ocean mostly on anguilliform fishes (Pernetta, 1977; Shetty, 2000; Shetty and Shine, 2002; Reed *et al.*, 2002; Ineich and Laboute, 2002). Sea snakes community represents an efficient sampling tool for anguilliform fishes such as the eels (moray, conger and snake eels) that live in holes and crevices of the reef (Reed *et al.*, 2002; Ineich *et al.*, 2007). Indeed, a previous study had recorded about 44 species of morays, congers and snake eels found in the stomachs of sea snakes (Ineich *et al.*, 2007).

In the frame of an ecological study on the New Caledonian sea snakes (FB thesis), the stomach contents of two species of sea snakes, *Laticauda laticaudata* (tricot rayé bleu, brown-lipped sea krait) and *L. saintgironsi* (tricot rayé jaune, yellow-lipped sea krait) were analysed in order to determine their diet.

Among the moray eels recorded, 16 specimens of *Cirrimaxilla formosa* Chen & Shao, 1995, were found in the stomachs of the two species of sea snakes. These specimens represent the first record of *C. formosa* from New Caledonia. This moray was recently described from a single specimen found in a tidal pool in Nanwan, southern Taiwan; this holotype is preserved in the collection of the Museum of the Institute of Zoology, Academia Sinica (no ASIZP.056729, 166 mm TL).

MATERIAL AND METHODS

The two species of sea snakes *Laticauda laticaudata* and *L. saintgironsi* were collected mainly on the beaches of islets Amédée and Signal, situated in the southern lagoon of New Caledonia, during several surveys carried out between January 2005 and February 2006. The sea snakes were captured by hand, measured, tagged and



Figure 1. - *Cirrimaxilla formosa*, 320 mm TL (MNHN 2007-0126), found in the stomach of sea snake *Laticauda laticaudata*, captured in Amédée islet, New Caledonia. The digested posterior part of the body shows that this specimen was swallowed by the tail. [*Cirrimaxilla formosa* trouvé dans l'estomac du serpent de mer *Laticauda laticaudata*, capturé à l'îlot Amédée, Nouvelle-Calédonie. La partie postérieure digérée du corps indique que ce spécimen a été avalé la queue la première.]

released. Stomach contents were obtained through gentle palpation of the snakes to force them to regurgitate. Each prey item was weighted, measured and preserved for later identification. Five *L. saintgironsi* and 11 *L. laticaudata* had specimens of *C. formosa* in their stomachs; the capture data are given in table I.

A specimen in good shape (Fig. 1) was deposited in the collections of the Muséum national d'Histoire naturelle, Paris (MNHN 2007-0126).

RESULTS AND DISCUSSION

The snakes swallow their prey either by the head or by the tail, and because of their length, the morays are digested gradually as they enter into the stomach. Depending on the digestion rate, prey may be intact or have either their anterior or posterior part digested. Thus, it was possible to identify the species in using the original description of *C. formosa*, which is the only reference available on this species (Chen and Shao, 1995).

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Table I. - Capture data related to the specimens of *Cirrimaxilla formosa* found in the stomachs of the two species of sea snakes *Laticauda laticaudata* (LL) and *L. saingironsi* (LS). [Données de capture des spécimens de *Cirrimaxilla formosa* trouvés dans les estomacs des deux espèces de serpents marins *Laticauda laticaudata* (LL) et *L. saingironsi* (LS).]

N° moray	Sea snake	Locality	Date	Swallowed by	Trunk length mm	Tail length mm	Total length mm
29-1	LS - 685	Signal	24.01.2005	-	160	120	280
29-2	LS - 685	Signal	24.01.2005	tail	-	-	-
137	LS - 818	Larégnère	11.02.2005	tail	-	-	-
426	LS - 1187	Amédée	7.04.2005	head	-	-	-
504	LS - 1288	Amédée	8.05.2005	head	190	135	325
160-1	LL - 843	Amédée	16.02.2005	head	160	100	260
160-2	LL - 843	Amédée	16.02.2005	head	-	-	-
227	LL - 914	Amédée	17.02.2005	tail	-	-	-
306	LL - 1040	Mba	12.03.2005	head	-	-	-
513	LL - 1114	Amédée	9.05.2005	tail	-	-	-
581-1	LL - 1188	Amédée	13.11.2005	head	-	-	-
581-2	LL - 1188	Amédée	13.11.2005	head	140	100	240
587	LL - 1212	Amédée	14.11.2005	tail	265	155	420
591	LL - 921	Amédée	15.11.2005	head	145	100	245
818	LL - 21	Signal	14.02.2006	tail	-	-	-
819	LL - 1523	Signal	14.02.2006	tail	-	-	-

The diagnostic characteristics of *C. formosa* were shared by the New Caledonian specimens: dorsal and anal fins restricted to tip of tail (subfamily Uropterygiinae); tail shorter than trunk; lower jaw protruding; posterior nostril oval with raised, petal-shaped rim, hooked fang-like teeth, margin of both jaws with many beard-like cirri (genus *Cirrimaxilla*); along with the distinctive colour pattern of the species consisting in a conspicuous dark brown network of anastomosed stripes on a tawny background.

Among the 16 specimens of *C. formosa* found in the stomachs, 6 were in good shape enough to measure or estimate their total length (Tab. I) varying from 240 mm to 420 mm TL. These are adult specimens since the Taiwanese holotype was a gravid female of 160 mm LT.

These records extend greatly the distribution of *C. formosa*, which is so far only known from southern Taiwan. Its geographical range might even be larger as without the "help" of the sea snakes, the species would not have been recorded from New Caledonia. The type of *C. formosa* was found in a tidal pool in southern Taiwan, but in New Caledonia, this species must live hidden in deep reef holes and inaccessible to any fishing gear. Logging studies (still under way, unpublished data), have shown that the sea snakes are likely to leave the reef to dive on the external slope down to 80 m depth. Thus, these specimens of *C. formosa* may have been captured by snakes during deep dives. Alternatively, this species may present a secretive ecology, being undetectable to classical fish

sampling (Ineich *et al.*, 2007). In Taiwan, the sea snakes do not feed on moray eels; hatching snakes feed on Mugiloididae, subadult and mature snakes on Emmelichthyidae, Acanthuridae and Pomacentridae (Su *et al.*, 2005), showing a wide range of adaptation of their feeding habits.

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